

final report

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Halal Blood Collection

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Executive Summary

Two New Zealand abattoirs that collect pharmaceutical-grade blood from Halal-slaughtered cattle were inspected to evaluate collection methods. In addition the major blood collector and processor in New Zealand described the preferred method of collection. Virtually all pharmaceutical-grade adult cattle blood collected in New Zealand is from Halal-slaughtered cattle. The number of abattoirs that collect blood was not verified but appears to be about 8 to 10. Blood is collected for two New Zealand-based blood processing companies and three Australian-based blood processors or exporters of plasma and serum.

Blood is collected from Halal-slaughtered cattle from a thoracic stick wound. The thoracic stick is applied as soon as possible after the Halal stick but the delay between Halal stick and thoracic stick may be 30 seconds. The bodies are prone on a static or moving table during blood collection. Three methods of collection were observed or described. One involves inserting a slotted hollow tube into the stick wound and draining blood through a flexible pipe to a batch tank. The other methods involve collecting blood in pans or buckets. In one case a pan is placed on the bleeding table alongside the stick wound and in the other case a bucket is held by hand under the stick wound. All methods appear to allow collection of sufficiently uncontaminated blood.

Yields of whole blood from Halal-slaughtered cattle are relatively low. Typical yields appear to be 4.5 to 6 litres per head although it was claimed that yields over 10 litres per head are possible. The time available for collection affects yields. Since blood is collected on a table rather than an extended bleed rail and other operations may be performed on the table, the time available for collection can as short as 10 seconds, particularly if there is a delay between the Halal stick and thoracic stick. The rate of blood flow from the stick wound is variable and also affects yield.

The value of whole blood collected from Halal cattle is equivalent to AUD \$0.6 to AUD\$0.87 per litre if the abattoir provides all labour and infrastructure. The value to the abattoir is less if the blood processor supplies labour for collection, recovery of plasma or serum and infrastructure. The value of the blood is partly related to the quality of the plasma or serum. There is no evidence that the reduced yield from Halal slaughtered cattle has any effect on the value of blood.

1 Introduction

A report to MLA in February 2011 by Kurrajong Meat Technology described the methods of collection of blood at Australian abattoirs. The purpose of the report was to provide information about the methods of collection, yields and values of adult cattle blood including pharmaceutical- grade blood. The information in the report could help Australian abattoirs to become involved in the collection of pharmaceutical-grade blood.

The report identified several abattoirs that are currently collecting pharmaceutical-grade blood and others that have previously collected blood. Of the abattoirs that previously collected blood, some discontinued collection when they adopted Halal slaughter methods. There is an increased risk of contamination of blood from Halal-slaughtered cattle by hair, ingesta and water. In addition yields of blood are low and therefore there is reduced financial return for the efforts of collection. The report stated that no pharmaceutical-grade blood is collected from Halal-slaughtered cattle in Australia but that blood is collected regularly from Halal-slaughtered cattle in New Zealand.

Since the February 2011 report, the major collector of pharmaceutical-grade blood in Australia has commenced a Halal kill. Blood is no longer collected for pharmaceutical use at this abattoir because the customers are not satisfied with the level of contamination. This abattoir was collecting up to 600,000 litres of chilled liquid plasma per year for sale to blood exporters and processors.

Australian processors and exporters of pharmaceutical-grade blood have a demand for blood which appears to be satisfied mostly from New Zealand. With increasing impetus for Halal slaughter, Australian abattoirs will have to either adapt to collection of blood from Halal slaughtered cattle or give up on collection of pharmaceutical-grade blood. This report identifies some of the collection techniques used at New Zealand abattoirs and associated values and yields

2 Objectives

The project objective is to evaluate methods of collecting pharmaceutical-grade blood from Halal slaughtered cattle. Specific questions to be addressed are:

1. whether increases in Halal slaughter have impacted on the collection of blood for pharmaceutical use?
2. what is best-practice for collection of blood from Halal-slaughtered cattle?
3. what are yields of blood from Halal-slaughtered cattle and the effect of yields on value?

3 Methodology

The project was conducted by visiting blood collection and processing facilities and interviewing people who are involved in blood collection in New Zealand.

4 Results

4.1 Overview

Abattoirs and blood processors visited in New Zealand were:

Auckland Meat Processors. Southern Cross Biotechnologies collect and process blood at Auckland Meat Processors.

Invitrogen (Life Technologies). The major New Zealand user of pharmaceutical-grade blood with a facility in Christchurch for extraction of blood products including BSA and pro-thrombin. Invitrogen has a demand for the equivalent of about 2 million litres of whole blood per year which it obtains from 2-3 abattoirs.

Greenlea Premier Meats, Morrinsville. Greenlea collects and processes blood and sells plasma and serum to an Australian-based blood processor.

Invitrogen and Southern Cross Biotechnologies are the two New Zealand companies that collect pharmaceutical grade blood from adult cattle. Southern Cross Biotechnologies collects at one abattoir and Invitrogen collect from up to three abattoirs. In addition, at least two Australian companies, Maverick Biosciences and Moorgate also collect blood in New Zealand. Moorgate buys blood plasma and serum from Greenlea Premier Meats and possibly others. Maverick buys blood from the Silver Fern group.

It appears that total blood demand in Australia and New Zealand can be satisfied by about 10 to 12 abattoirs. (Two abattoirs in Australia are known to collect blood and about 8 to 10 in New Zealand although the New Zealand collectors have not been confirmed and probably collect intermittently). It was reported that virtually all blood collected in New Zealand is from Halal-slaughtered cattle.

4.2 Blood collection and processing methods

4.2.1 Auckland Meat Processors

Auckland Meat Processors (AMP) claims to have the largest annual cattle kill of any abattoir in New Zealand. At the time of the visit the daily kill was about 700.

Southern Cross Biotechnologies has a contract to collect blood at AMP. Southern Cross Biotechnologies has installed collection facilities on the beef slaughter floor and a processing facility and office in a demountable building under the slaughter floor. Southern Cross Biotechnologies provides the labour for blood collection on the slaughter floor and for processing blood to produce serum.

At AMP, cattle are stunned by head-only (reversible) electrical stun. Stunned cattle roll out of the knocking box onto their backs in a static cradle. The Halal slaughterman performs the Halal stick and severs the jugular veins, aortas, trachea and oesophagus. The body is immediately discharged from the cradle onto its left side on a conveyerised bleeding table. On the bleeding table an immobilising electrode is applied to the hind legs of the body and a second slaughterman opens the hide over the neck, frees the trachea and

oesophagus and performs a thoracic stick by inserting his knife into the thoracic cavity and cutting the aortic arch and possibly the heart.

Immediately after the thoracic stick the blood collection operator inserts a collection tube through the stick wound into the thoracic cavity. The collection tube is connected by a flexible pipe to a stainless steel pipe in a small annex on the slaughter floor. The stainless steel pipes drains to the blood processing room under the stick hole.

When the immobilisation current stops, the body, with the blood collection tube in place, travels on the conveyerised bleeding table to the oesophagus clipping and rodding station and the shackling station. The blood collection tube is removed before the weasand clip and rod station. The collection tube is in place for up to 30 seconds.

4.2.2 Issues with collection at AMP using the collection tube

The blood collection area is crowded. There are four AMP employees working alongside the bleeding table and two Southern Cross Biotechnologies blood collection personnel. There is a small annex which accommodates one of the Southern Cross employees who cleans and sterilises the collection tubes.

The yields of blood depend on the time the tube is left in place in the thoracic cavity. This was reported to be 30 seconds but it was acknowledged that the time available for collecting blood depends on co-operation between the AMP staff and Southern Cross Biotechnologies staff. The slaughter rate was reported to be 2 per minute. It seems unlikely that blood is collected from every body but this is the target.

If electrical stunning is not effective and the animal is shot with a bolt, blood is not collected because this does not comply with EU requirements. There was no evidence of leakage from the cut oesophagus but if there are signs of leakage, blood is not collected. This collection method seems to be very clean. If the collection tube is handled correctly there is little risk of contamination of blood with water, hair or ingesta.

4.2.3 Invitrogen collection method

The collection method used by Invitrogen was described but not observed. Invitrogen collect at several abattoirs which have conveyerised bleeding tables similar to the AMP table. In some circumstances blood may be collected by Invitrogen staff but is more usually collected by the abattoir staff.

Blood is collected after the thoracic stick is made. A pan about 350 X 250 mm and 100 mm deep (about 8.5 litre capacity) with a handle is placed on the bleed table next to the stick wound but not in contact with the body. The pan travels along the table with the body as blood spurts into the pan.

4.2.4 Collection at Greenlea

The slaughter method at Greenlea is different from the AMP method. The slaughter rate is one every 2 minutes. Animals are electrically stunned and roll into a static cradle for the Halal stick. They are then discharged from the cradle onto a static bleeding table. An immobilising electrode is applied to the hind legs. Immobilisation is applied for 30 seconds. The establishment is approved for export to Malaysia and a condition of the Malaysian Halal requirements is that there must be a 30 second interval between the Halal stick and the thoracic stick.

When the timed immobilisation current switches off, the slaughterman opens the neck, frees the oesophagus and trachea, applies a weasand clip, rods and performs the thoracic stick. The blood collection operator then steps in and collects blood in a hand-held bucket of 8 litre capacity. The body is then shackled and hoisted. The blood collection operator must complete collection and step away for safety reasons when the body is hoisted. The time available for collection is about 10 seconds.

The bucket of blood is taken to a room immediately off the stick hole for processing. In the stick hole there is one slaughterman and one blood collection operator.

4.2.5 Issues at Greenlea using manual collection in buckets

Between bodies the bleeding table is washed by hosing and is then sterilised with 82^oC water. This is not fully effective and could result in contamination of blood by contact with the table during blood collection.

Because there is 30 seconds delay between the Halal stick and thoracic stick, blood is lost before the thoracic stick can be made. The time available for collection is only 10 seconds. It was observed that the flow of blood from the stick wounds was variable. I suspect this is due to the placement of the sticking knife i.e. whether the aortic arch was completely severed, although the blood flow may be affected by other factors. Because of the differences in the flow of blood, less than half a bucket was collected from some bodies in the available time and a full bucket was collected from other bodies.

The body should roll out of the knocking box and onto the bleed table such that the neck overhangs the side of the table and the collection bucket can be held under the neck (see Figure 3). This does not happen for every body and blood cannot be collected if the body is not positioned suitably on the table. A pusher has been installed in the rear of the knocking box knocking box to push the animal as far forward as possible so that the body rolls out in the correct position but this does not work on every occasion.

Blood is only collected from bulls and cows. It is not collected from steers because they may be treated with HGP making the blood ineligible for the EU market.

The cow and bull bodies were large and the typical carcass weight is 400 kg. This should result in a high yield of blood.

4.3 Yields

Southern Cross Biotechnologies reported that it achieves a yield of 6 litres per body but claimed that 12 to 14 litres is possible with full co-operation of the abattoir employees in the stick hole. Invitrogen reported that the yield of blood from Halal-slaughtered cattle is half the yield from conventionally-slaughtered cattle. A yield of 4.5 to 6 litres is expected from Halal slaughtered cattle Greenlea reported that the yield of blood was 10 to 15 litres per body but clearly this was not the case.

The change to Malaysian Halal slaughter requirements has reduced the time available for collection and only one bucket with maximum capacity of 8 litres can be collected. Some full 8 litre buckets were collected but on many occasions the bucket was half full. From my unsubstantiated observations, the average yield from bodies from which blood could be collected was about 5 to 6 litres. Before the Malaysian-style Halal

slaughter method was used, the thoracic stick was applied after the Halal stick without delay and there was sufficient time to collect blood in two buckets. In these circumstances it is possible that more than 10 litres could be collected from the large bodies slaughtered at this establishment.

Yields are affected by the number of bodies from which blood is collected in addition to the amount of blood that can be recovered from a body. At AMP the number of bodies from which blood can be collected was not assessed. However, in view of the congestion in the stick hole, observations of poor location of bodies on the bleed table and the acknowledgment that blood is not collected from cattle that are shot, it can be assumed that blood is not collected from all animals.

At Greenlea it was stated that blood is collected from 95% of cattle. The location of bodies on the bleed table affects whether blood can be collected. It was stated that before the pusher was installed in the knocking box blood was collected from about 85% of bodies. From an inspection of the daily blood collection sheet it appeared that blood was collected from less than 95% of bodies. Some blood is lost because cattle are condemned and since the kill was culled cows and bulls, condemnation rates are probably higher than at other abattoirs.

After blood is defibrinated it is combined in buckets of blood from three bodies. If a body is condemned the bucket containing the defibrinated blood from the condemned body is discarded along with one bucket either side. Thus one condemned body can result in the loss of blood from nine bodies. Blood was not collected from some bodies because of poor positioning on the bleed table or for other reasons. From the daily collection sheet it appeared that the blood had been collected from about 85 to 90% of bodies including loss of blood from about 7% of bodies due to condemnations.

4.4 Value

The price paid for blood was not fully transparent.

In the case of Southern Cross Biotechnologies, the purchaser provides all the labour and infrastructure for collection and processing. The abattoir is paid on the basis of serum recovered by Southern Cross Biotechnologies. The price is NZ\$1 per litre of serum. This price takes into account a 20 cent discount which is AMP's contribution to set up costs. This discount is supposed to be lifted when set up costs are amortised (supposedly in one year but collections have been lower than expected due to weak sales).

It was reported that the yield of serum from whole blood is 50%. If the price of serum paid to the abattoir is considered to be NZ\$1.2, the whole blood value is NZ\$0.6 (about A\$0.46). The Biological Supplies Manager of Invitrogen stated that the price paid for plasma is NZ\$1.75 for B-grade plasma and NZ\$1.88 for A-grade. These prices are based on the abattoir supplying all labour and infrastructure with the exception that Invitrogen supply a separator and 2 litre pails for packing the plasma or serum.

Plasma priced at NZ\$1.75 to NZ\$1.88 is equivalent to whole blood value of about NZ\$1.05 to NZ\$1.13 per litre (A\$0.82 to A\$0.87 per litre).

Greenlea uses its own labour to collect and process blood and has installed its own infrastructure for collection and processing. It was claimed that the price paid was equivalent to NZ\$8 to NZ\$9 per head.

Based on management expectations of recoveries, this could equate to about NZ\$0.8 to NZ\$0.9 per litre of whole blood (A\$0.61 to A\$0.69 per litre).

4.5 Collection and value of blood from Halal cattle in Australia

In the February 2011 report only three Australian collectors of pharmaceutical blood were identified. The largest collector, who recovered 600,000 litres of liquid plasma per year, has since converted to a Halal kill and has confirmed that blood is no longer collected for pharmaceutical use. The main problem at this establishment is that immediately after the Halal stick the bodies are hoisted onto the rail. When on the rail there the pressure in the rumen leads to regurgitation.

Although the oesophagus is plugged the plug may not hold leading to release of rumen content. There is a thoracic stick on the rail and blood is collected in a trough but the blood is too highly contaminated with ingesta but be suitable for pharmaceutical use.

Other establishments have reported that they discontinued collection of pharmaceutical-grade blood after introducing a Halal kill. Clearly the expansion of Halal kills in Australia has reduced the collection of blood for pharmaceutical use. Australian processors and exporters of pharmaceutical blood now obtain blood from New Zealand to meet demand. The trend to increased Halal kills is not likely to be reversed.

Blood collectors and processors in New Zealand all bemoaned the low yield of blood from Halal cattle. However, there was no suggestion that the low yield justified a higher price. Southern Cross Biotechnologies, who collect blood and extract serum, pointed out that the cost of serum production depends on how much serum is collected in a shift. The lower the recovery, the higher the production costs per litre and the less reason to increase the price paid to the abattoir.

Invitrogen commented that blood from Halal cattle has been collected in New Zealand for many years and is the norm. In addition, there is more than enough adult cattle blood to meet demand and low yields do not have a material effect availability of supply.

In the February 2011 report, pharmaceutical grade whole blood for recovery of serum was valued at \$1.34 per litre but this applied to an abattoir that sold and exported serum direct to an overseas customer. The value of whole blood used to make plasma for sale to blood processing companies in Australia was \$0.52 to \$0.68 per litre. New Zealand values are about A\$0.46 per litre of whole blood where the blood processor supplies all the collection labour and infrastructure and A\$0.61 to A\$0.87 per litre where the abattoir supplies labour and infrastructure.

It appears that the value of pharmaceutical-grade blood to New Zealand abattoirs is higher than it is to Australian suppliers but there is no evidence that this is due to collection from Halal-killed cattle and lower yields in New Zealand. There is hearsay evidence that the price difference is due to better quality plasma and serum collected in New Zealand.

4.6 Best practice for collection of blood from Halal cattle

Three methods of collection of blood from Halal cattle are described above. The different methods suit different stick hole and bleeding arrangements and different slaughter rates.

Points about best practice are:

- Halal cut should be followed by a thoracic as soon as possible to allow the maximum time to collect blood from the thoracic stick wound
- The thoracic stick and blood collection should be completed while the body is prone on a table. If the body is hoisted before blood is collected there is a risk of contamination of the blood from ingesta spillage. This contamination can probably be prevented by clipping the weasand but weasand plugs are not fully effective. At the New Zealand collection sites, no leakage from either clipped or unclipped weasands of cattle bled in a prone position was observed
- I only observed blood being collected from Halal-killed cattle prone on a bleeding table. It was claimed that the collection tube method could be used with cattle hanging from a rail The methods of collection in pans or pails are probably less suitable for collection from cattle on a rail because of the risk of contamination
- The collection tube method appears to have the best chance of getting a good yield although I have only limited data to support this
- The collection tube method appears to be exposed to the least risk of contamination
- The collection tube is attached to a flexible tube which must lead to a fixed pipe or collection bucket. The flexible pipe is an impediment in the stick hole
- The collection pan placed next to the stick wound of a body is the least nuisance as far as other workers in the stick hole are concerned but recovers the lowest yield

4.7 People who assisted with this report

The following people were generous with their time and openly discussed blood collection -

- Alan von Tunzelman, Manager, PVL Proteins division of Auckland Meat Processors
- David Dransfield, Chairman, Southern Cross Biotechnologies
- Rodger Beck, Australasian Biological Supplies Manager, Invitrogen
- Russell Shaw, Plant Manager, Greenlea Premier Meats